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JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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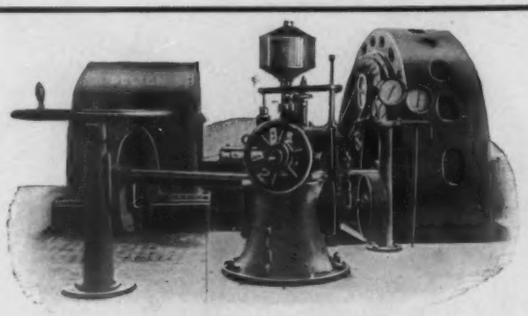
FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT



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JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXV SAN FRANCISCO, OCTOBER 29, 1910. NUMBER 18

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THE DENVER ELECTRIC SHOW

The first annual electric show at Denver, held under the auspices of the Colorado Electric Club, was brought to a brilliant and successful culmination on Saturday night, October 15th. That it was likewise financially profitable is due not only to the enthusiastic support given by the people of Colorado but also to the untiring efforts of the directors. The personnel of the board was H. L. Woolfenden, president; F. W. Frueauff, first vice-president; J. B. Griffith, second vice-president; C. F. Oehlmann, secretary and treasurer; Alvin R. Hall, George A. Woolley, W. G. Matthews, Walter F. Brown, W. P. Carstarphen Jr., John M. Connelly and B. S. Manuel.

Besides the brilliant interior illumination from ten thousand incandescent lamps and flaming arcs, the exterior of the auditorium as well as the surrounding streets were a blaze of light, 25,000 additional street lamps having been used to give a portiere effect.

General View of Denver Electric Show.

The most notable lighting feature of the show was the beautiful sunrise effect showing a typical Rocky Mountain landscape with a running stream. Four times each day all other lights were extinguished to display this to the best advantage. The brilliant coloring of a Colorado dawn preceded the gradual appearance of the rising sun, an eight-foot disc studded with twenty-five hundred lamps and uniformly regulated by

Chamber of Wonders.

a system of clock-work to give a most realistic effect. A number of flashers gave the effect of moving water in the mountain stream.

Much popular attention was attracted by the Chamber of Wonders in the basement; a large room draped in somber colors, in which was displayed the modern wonders of electricity, principal among these being a specially designed apparatus for producing high voltages at high frequencies; this apparatus consisting of an oil immersed transformer with a primary winding, taking 440 volts a.c., 60-cycle current, the secondary giving 150,000 volts, this current being connected to the primary of a Tesla coil through large 40-plate glass condensers, and multiple spark gap oscillator, which produced at the secondary terminals of the Tesla upwards of one million volts, at high frequency.

The exhibit showed the disruptive power, through the piercing of glass plates, brush discharge, climbing arc, illuminating of Geissler tubes and vacuum electrodes, imitation thunder and lightning, passing of the million volts through the body of the experimenter, and lighting incandescent lamps held in his hand, and various other beautiful and spectacular demonstrations.

There was also exhibited in this room an electric water forge, in which bars of iron were heated red hot by immersing in a tank of cold water; the telautograph, an instrument whereby writing, drawings, etc., will transmit to any distance over wires by electricity; a singing arc; the Thompson electro magnetic experiments, which include lighting of incandescent globes immersed in water without wire connections, leaping rings and discs and many other wonderful and beautiful demonstrations of the electro-magnetic field; wireless telegraph, wireless telephones and other modern applications of electricity. A complete meter testing exhibit showed the operation of all kinds of devices used for measuring current.

Allis-Chalmers Co. exhibited Bullock electric generators, transformers and motors.

American District Telegraph Co. showed their patent noninterfering watchman box in operation and a self-adjusting relay patented by W. W. Alexander. They also showed the old style watchman system.

American Multigraph Sales Co. exhibited one of their electric-driven printing machines and also one of their folding machines. A bulletin was printed here of the different events that took place during the day.

American Steel & Wire Co. showed a large assortment of different sizes of wire and cable.

Barker Cuisinette Co. showed one of their tables as it looked when used for a parlor table, dining table and kitchen table.

G. J. Booth showed a line of vacuum cleaners and electric vibrators.

Burnite Machinery Co. showed one of their combination electric and hand hoists, different styles of air drills and the Lyons steel locker.

Burroughs Adding Machine Co. exhibited one of their electrically driven machines.

The Cahn-Forster Electric Co. showed their Premier vibrator and the Mach therapeutic outfit.

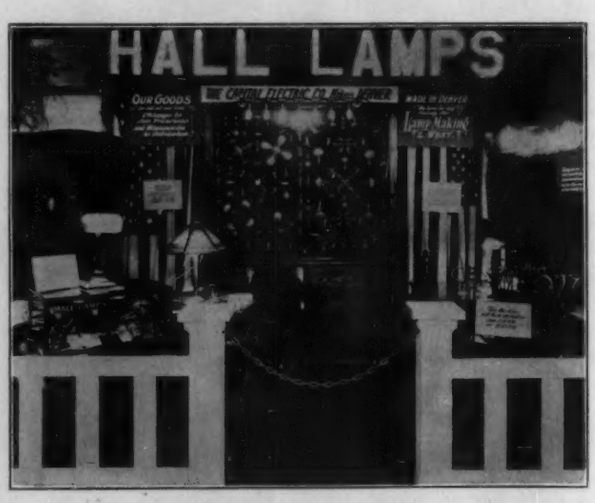


Exhibit of Capital Electric Co.

Capital Electric Co., makers of Hall lamps, exhibited their machine for making stems for filaments. They also had a display of all the different types of lamps, attractive electric signs and a case showing the material and ore that is used in making the tungsten lamps. They also had a meter showing the difference between the current consumption of a Mazda lamp and a carbon.

Carstarphen Electric Co. had an attractive booth

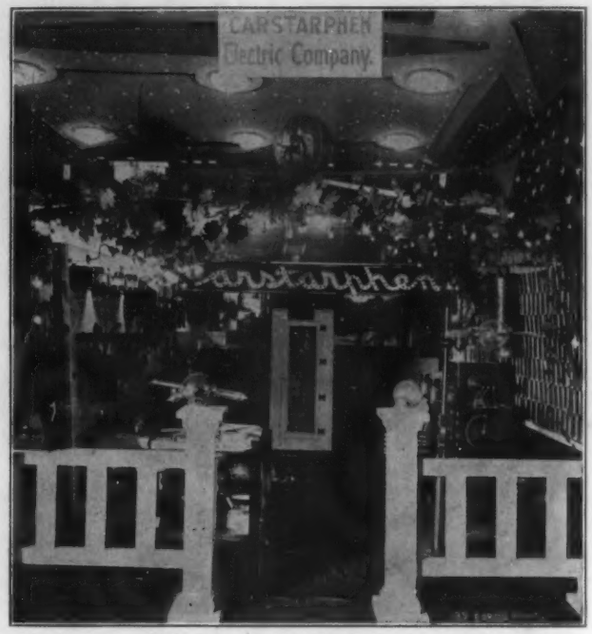


Exhibit of Carstarphen Electric Co.

on the main floor, besides the booth downstairs known as the "chamber of wonders." In the booth upstairs were exhibited an X-ray outfit in operation; two generating panels, two distributing panels made from Vermont blue marble, also one built from Colorado white marble, the first one built in Colorado. They also showed an extensive line of dry cells.

Central Colorado Power Co. showed their tower and insulators, also a sample of the wire used in transmitting 100,000 volts, with a map showing the territory covered.

Central Electric Co. of Colorado Springs showed their electric water boiler and different electric cooking appliances.

Classon Map Co. showed their electric blue printer in operation.

Colorado Machinery & Supply Co. showed a motor driven pump in operation, fly wheels and different types of steam whistles.

Colorado Telephone Co. had the central office in the show. They supplied free telephones for all the booths and free public service both in the building and on the outside. They also exhibited their old switchboard that they used twenty years ago and the one now in use.

Cook Railway Signal Co. showed their old style of gate and block system, also their latest patent giving a practical demonstration.

Curran Co. displayed electric signs.

Denver Omnibus & Cab Co. exhibited Exide storage and ignition batteries for gasoline automobiles.

Denver City Tramway Co. had a unique booth showing the appliances used twenty years ago and those used today in connection with street railway operation. The old style controller and the improved controller, the old style armature and the latest patent, the different sizes of nails used, the patent Kitt electric switch which is used all over the system, different types of lightning arresters that they have used, with demonstrations, and samples of trolley wire. They had some very interesting posters showing the result of stepping off the car backwards.

Denver Dry Goods Co. exhibited portable lamps, furniture and cut glass and had the booth beautifully decorated with hot house plants.

Denver Electrical Co. exhibited electric fixtures, heating devices and novelties.

Denver Electric Wiring Co. demonstrated their latest cooking and household utensils.

Denver Post offered prizes to boys bringing the best home-made machines. There were two classes, A and B. The first prize for Class A was $100, the second $75. First prize for Class B was $75, second prize $50. Those who competed for the prizes were: Aubrey Force, model of a monoplane; Mark Avery, aeroplane; William Bowels, electric firehouse; John Broadbrook, electric automatic switch; Frank Rittick, triplane; T. Banks and W. H. Smith, Tesla coil and spark; Edward Doyle, C. L. Wood, Walter Anderson, W. S. Gromm, Robert Hamilton, wireless telegraph apparatus. The winners: First prize, Class A, W. S. Gromn; second prize, Class A, Edward Doyle. First prize, Class B, Theodore Banks; second prize, Class B, Robert Hamilton.

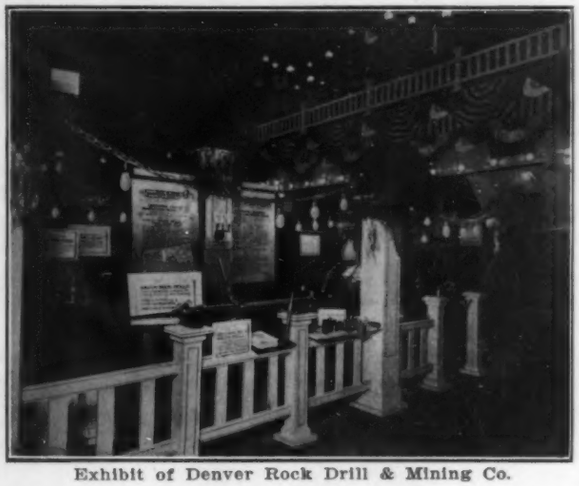
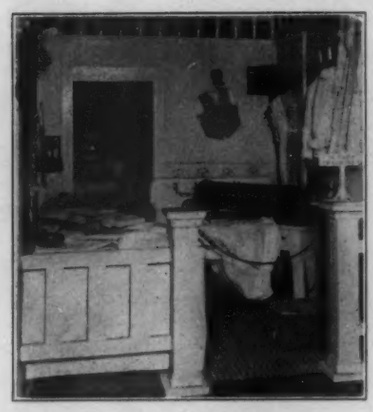


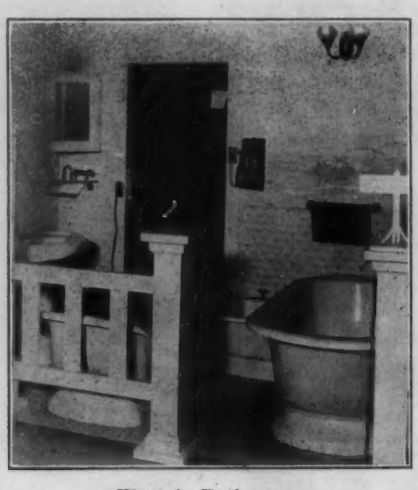
Exhibit of Denver Rock Drill & Mining Co.

Denver Rock Drill Co. exhibited an extensive line of machinery, giving demonstrations of drills and electric pumps.

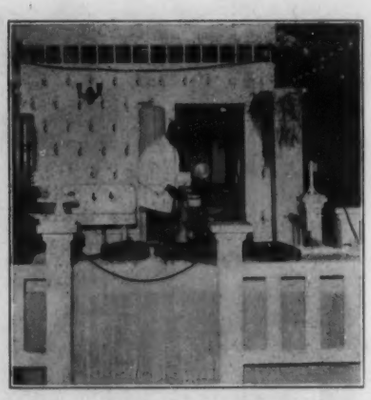
Denver Gas & Electric Co. illustrated the equipment of a modern electric home of five rooms, a hall and a bathroom, each being equipped with an electric call bell and efficient electric illumination. The living room was further equipped with an electric grate, electric piano and lamp, electric fan and electric ozonizer, the dining room with an electric chafing dish, toaster, coffee percolator and electric flowers; the kitchen with an electric range, water heater, waffle iron, sad iron, toaster, fan and disc stove; the bedroom with an electric curling iron, sad iron, vibrator, vacuum cleaner, fan, heating pad, food warmer and milk warmer; the bathroom with an electric shaving mirror, heater and coil; and the laundry with an electric washing machine, iron and mangle. This company also had an industrial exhibit in the basement at which they showed an electric dishwasher, clothes washer, laundry stove and clothes dryer, as well as electric soldering irons, glue pots and tailor irons.



Electric Laundry.
Exhibit of Denver Gas & Electric Co.



Electric Bathroom.



Electric Kitchen.
Exhibit of Denver Gas & Electric Co.

Electric Fireless Cook Stove Co. demonstrated their stoves.

Electric Motor Equipment Co. showed a complete electric laundry outfit in operation, also a line of vacuum cleaners, besides other appliances.

Electric Storage Battery Co. displayed "Choride" and "Exide" accumulators and small lighting outfit for farm use.

Electric Supply & Construction Co. exhibited Vortex vacuum cleaners and Imperial washing machines, both in operation; also a line of fixtures and other appliances.

Ellis Electric Sign Co. exhibited samples of their electric letters and photos of different installations around Denver.

Felt & Tarrant showed the Comptometer in operation.

Flint Lomax Mfg. Co. had an interesting booth in the basement where they exhibited their electric power hammers, welder, electric box drill, automatic screw machines and Doherty's gas colorimeter in operation.

General Acoustic Company exhibited the Acousticon, the Dictograph, and the Dimaphone.

General Electric Co. had an attractive booth and gave practical demonstrations of all the different appliances that were exhibited. They exhibited a full line line of heating and cooking devices, including a new type of electric range. A complete line of motors for household use were shown, as was a small motor for grinding purposes, also an automatic flow control pump. Full line of electrical Christmas tree decorations, giving demonstrations of the different kinds of fruit represented in electrical bulbs. A full line of meters both of steam and electric, also a new type of the prepayment wattmeter. A gasoline generating set which is used in government work was shown in full operation, also a 25-kw. steam turbine in operation. There was also exhibited a three-phase induction motor with automatic overload and no-voltage release, a d.c. and a.c. new type motor with new type starting device, a new type single-phase variable speed a.c. motor, also a motor-driven sewing machine on which men made bonnets that were given to the ladies. The booth was beautifully illuminated by 500-watt Mazda lamps. The sign "General Electric" contained 422 electric bulbs. Candy bearing the sign "G. E." and cigars were given out.

General Vehicle Company made a display of electric trucks for commercial use.

Great Western Oil Co. displayed their different grades of oil in attractive jars.

Hadley & Hine exhibited Elliott and Fisher electric billing and adding machines, Barnett adding and calculating machines and Flexotype electric duplicating machines.

Hendrie & Boltholff Mfg. & Supply Co. displayed

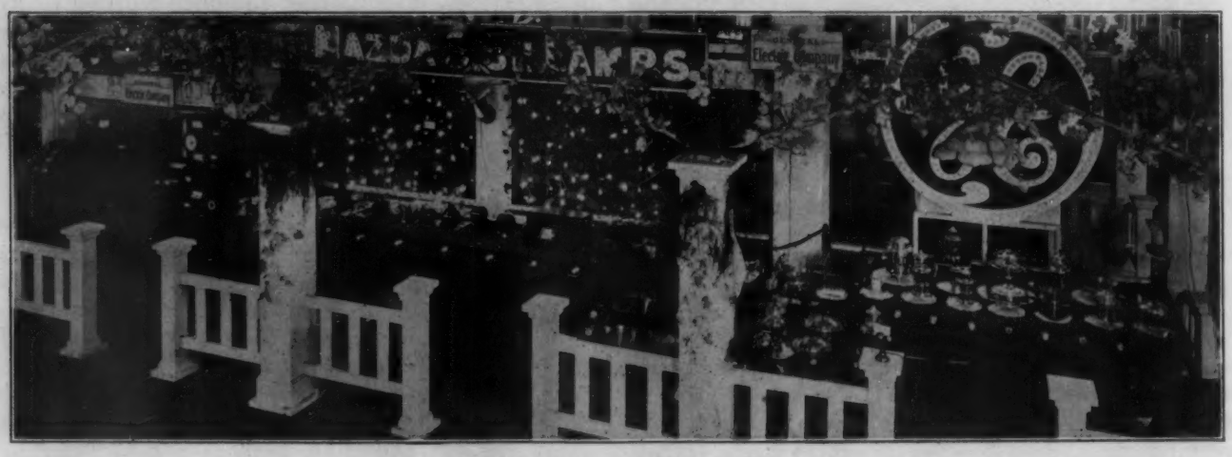


Exhibit of General Electric Co.

Exhibit of Hendrie & Boltholff Mfg. & Supply Co.

a full line of machinery, all of which was in operation. This included Aldrich mining pumps, Jackson centrifugal irrigation pumps, Paul deep well pump, Deming deep well pump and Hendrie & Boltholff mine hoists; Fort Wayne motors, generators, meters, transformers and controllers; Condit switches and circuit breakers; U. S. electric tools and a full line of wiring supplies and specialties. Their electric hoist attracted much attention, being used to hoist a bucket to the ceiling.

Jackson & Wood exhibited a variety of their automobile lamps, also four different colored lamps attached to a wheel, which when rapidly revolved made a pleasing sight.

Krebs-Covington Auto Co. exhibited one of the latest models of Detroit electric coupes.

McPhee-McGinnity Art Glass Co. had a display of the different colored glasses used in their domes and shades.

Mine & Smelter Supply Co. exhibited a 25-h.p. electric mine hoist, magnetic clutch, Yale & Towne triple chain blocks, a small irrigation plant in operation and an electric drill.

Lindrooth-Shubart Company, Denver, showed Goodman electric locomotives, Kerr steam turbines, turbo generators, and Ridgway automatic engines and generators.

McMurty Paint Co. exhibited a full line of paints, stains and varnishes.

National Carbon Company, Cleveland, Ohio, exhibited a line of arc-lamp carbons, brushes and batteries.

National Electric Lamp Association occupied four booths to the left of the main entrance. The booth was tastefully decorated with flowers, palms and foliage. A pergola in the rear served as a reception room. Besides the regular lines of Mazda and tantalum 110 and 220-volt lamps shown were the Mazda street series and sign lamps, the new 400 and 500-watt Mazda lamps, a complete line of Mazda and tantalum round bulb, meridian and Mazda miniature lamps. Mazda lamps equipped with Holophane reflectors were shown burning on one rack, the new double-wound tantalum street railway lamps were shown in contrast with carbon street railway lamps on another rack, the power consumption of each being shown by an integrating wattmeter. A small Bunsen photometer and a model of a rotating mirror photometer illustrated some of the methods used in measuring light. The latter also illustrated the distribution of light about a Mazda-Holophane unit. A number of automobile fixtures were shown equipped with six-volt Mazda automobile lamps lighted from storage battery. An interesting historical feature was an exhibit of Goebel lamps made by Henry Goebel of New York in the early 60's.

Mountain Electric Co. showed vacuum cleaners in operation, also different types of motors and electric irons.

New England Electric Co. showed different types of telephones and also an assortment of Klein tools, conduits, condulets and different sizes of lamps and fuses.

Northern Colorado Power Co. showed a map of the territory they cover and exhibited motors and vacuum cleaners.

Northwestern Supply Co. exhibited a line of their insulators and showed a model of the tripartite steel tower.

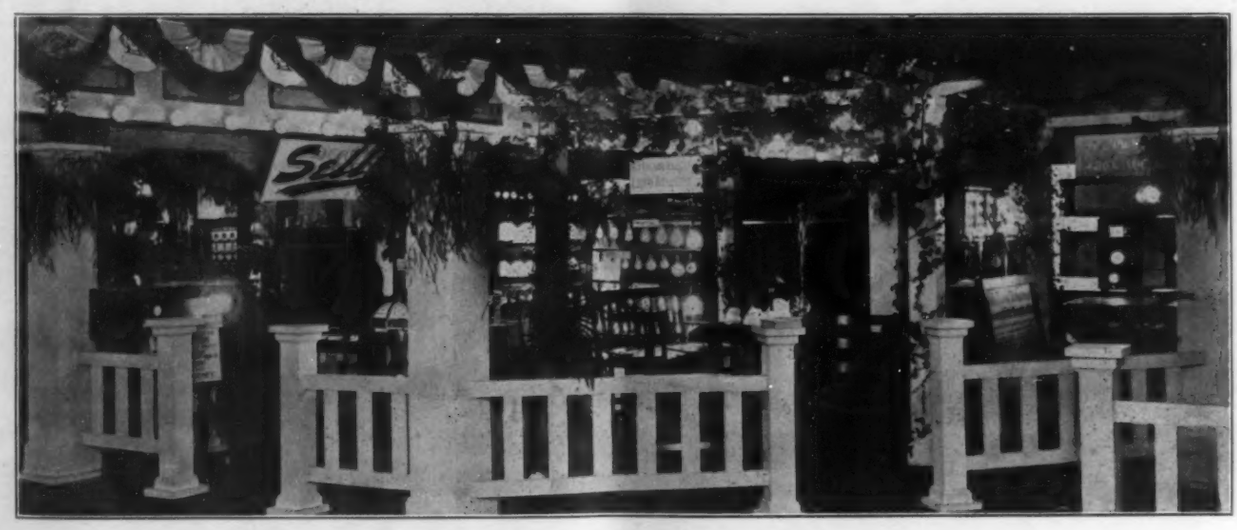


Exhibit of National Electric Lamp Association.

Exhibit of Albert Sechrist Mfg. Co.

Ogier, Silsbee & Ogier Creosoting Works showed poles, ties and fence posts that had been treated with creosotes, also cross-sections showing the depth of penetration.

Ohio Brass Co. showed different sizes of insulators.

Onderdonk Engineering Company represented Babcock & Wilcox boilers, asbestos goods and Lagondo boiler specialties.

Park Floral Co. had a beautiful booth filled with different varieties of flowers.

Robinson & Rogers Supply Company, Denver, exhibited Hughes electric ranges, Sykes electric fireless cookers and other electrical devices and appliances.

Sangamo Electric Co. exhibited a line of their ampere hour meters for electric wagons.

Albert Sechrist Mfg. Co. occupied six booths at the extreme end of the building and were attractively decorated. The first contained cut glass domes, portables and ceiling fixtures; second, shower fixtures, crystal brackets and a beautiful bronze figure; third, a complete line of crystal fixtures; fourth, fixtures of shower effects and ceiling pieces; fifth, ceiling pieces of bunches of crystal grapes and shower effects; sixth, principally hammered brass work, giving demonstrations of how the flat brass is formed in the many different shapes of shells.

Sells Candy Co. sold candy and showed an attractive line of candy boxes.

Chas. A. Schieren Belt Co. showed a complete line of belting.

Silver State Electric Co. exhibited a motor partly wound, also their patent electric automobile horn, giving demonstrations.

Simplex Electric Heating Company, Chicago, Ill., displayed a full line of electrical heating appliances.

Smith Brooks Co. showed one of their electric presses in operation, also different samples of printed matter, such as posters, folders, postals and stationery.

Standard Electric Utilities Co. occupied three booths with their Vohr electric ozonizer, giving demonstrations of purifying the atmosphere.

Stearns-Rogers Mfg. Co. exhibited a model of a Heine boiler, Haines air pump, Dorr classifier, and Ingersoll air drill and other appliances.

Exhibit of Westinghouse Electric & Mfg. Co.

Studebaker Vehicle Co. showed one of their 2500-pound electric trucks.

Thomas H. Smith Co. showed a line of motors in different stages of construction. Their booth was decorated with the tape used in the winding of armatures.

Technical publications represented included the Electrical World, the Electrical Review and Western Electrician, the Journal of Electricity, Power and Gas, Motor Field and Mining Science.

Wagner Electric Co. showed a complete line of their appliances, also two of their flaming arc lamps which brilliantly illuminated their booth.

Western Electric Co. exhibited a large sphere showing the different places throughout the world where they do business. They also displayed intercommunicating and house telephone supplies.

Western Electric Signs Co. demonstrated their method of lighting signs and showed the different types of signs and letters.

Western Engineering Specialties Co. showed washing machines, vacuum cleaners, electric soldering, hair dryers, massage outfits and their patent steam trap.

Western Vacuum Cleaner Sales Company, Denver, exhibited Keller-Santo vacuum cleaners.

Westinghouse Electric & Mfg. Co. had four booths, the corner entrance being fitted up with a miniature electric fountain which continually flashed the different colors through the water and a beautiful rose plant with the heart of the roses made up of small incandescent lamps. The next booth was called the "flag room" and in this place the Westinghouse Co. made with their sewing machine motor the largest American flag in the world, its width 68 ft., length 136 ft. The stars were 36 in. from tip to tip and each stripe 5¼ ft. in width; it contains 2300 yards of wool bunting and required about 72,000 yards of thread. This flag was finished on Thursday and with an impressive ceremony it was presented to the City and County of Denver, the Mayor and city officials being present. In the next booth was displayed the Westinghouse heating apparatus, their toaster stove being demonstrated. The last booth was used as a motor exhibit; one of the 125-h.p. motors which had operated 150,000 miles on the Denver & Interurban Railroad between Denver and Boulder was on display, looking none the worse for wear; there was also shown a 75-h.p., 2000-volt motor; their "CCL" small induction motors as well as their new mill type induction motor. Their whole booth was made up to represent a grape arbor with large clusters of grapes with incandescent lamps inside.

Softening of mica, to better suit it for the manufacture of insulating layers for commutation segments, may be accomplished by heating it to a temperature just below redness and then suddenly cooling it in water, thereby retaining its toughness.

Wireless lighting of incandescent lamps is reported from Copenhagen where Valdemar Poulsen, the inventor of the Poulsen system of wireless telegraphy, is said to have lighted two incandescent lights in one room by means of his transmitting apparatus in another without the aid of any ordinary mechanical connection.

CREOSOTE TREATMENT OF POLES.[1]

BY GEORGE R. OGIER.

During a conversation recently with one of your members, it was suggested that I come here before this meeting and talk on the creosote treatment of our native lodgepole pine poles. Although I accepted this task, anticipating a great deal of pleasure, I am not quite sure that my paper will convince all of the full importance of this matter and subject. However, I have endeavored to set forth the most important phases of the subject, in order to have a paper of a limited number of words, and yet have the desired effect.

First, for the benefit of those not familiar with the general subject of wood preservation, I will relate something of its history. Wood preservation is an old art, and has been practiced since the beginning of the 18th century. In 1705 Homberg soaked wood in an aqua solution of corrosive sublimate. In 1730 Job Baster saw the worth of this important subject when treating wood for shipbuilding purposes with an aqua of corrosive sublimate and arsenic. In 1740 Reed used wood vinegar. In 1756 the process generally used for preserving wood was by dipping it in boiling hot wood tar, and then later, about 1812, coal tar was first used by Cook for ships and ship timbers; and in 1838 dead oil of coal tar or creosote was first introduced as a preservative for timber by Mr. Bethell in England. Wood preservation began in the United States on a commercial scale in 1848, when Mr. James B. Frances established a cyaniding plant at Lowell, Mass. This plant is still in operation, although the amount of timber treated in it is comparatively small. About 1874 a creosote impregnating plant was established in West Pascagoula, Miss. This was the first plant of its kind erected in this country, and is still in active operation. Since the erection of this plant a number of others have been installed, the most rapid development being along the Gulf of Mexico. The gradual depletion of the timber supply, resulting in an increase in the price of the raw product, has more recently fostered the growth of wood preserving plants, especially throughout the central and eastern United States. In 1904 the total annual output of treated timber in the United States was approximately one-half billion feet b. m. In 1907 the number of plants had increased to sixty, with a total annual output of approximately one and a quarter billion feet b. m. New plants are being erected from time to time in various parts of the United States, and up to date the timber treating plants number seventy-two.

Up to the present time creosote has been recognized by our government, and those familiar with the good qualities necessary in wood preservatives, to be the best; it is the most costly and at the same time the most effective in preserving wood. ,

The preservation of wood from decay by treating it with chemicals which prevent the action of decay is of increasing importance in the United States. From the standpoint of the conservation of our rapidly diminishing forest resources, and the prevention of a possible timber famine, the preservative treatment of timber may be a most effective measure, because it

[1] Paper read at Eighth Annual Convention Colorado Electric Light, Power & Railway Association.

lengthens the service of the wood which is used and therefore decreases the amount necessary to supply the demand. From this point of view wood preservation has a distinct advantage over measures for the growing of more timber, since these measures require years in order to show their effect, while preservative treatment is a remedy which can be applied immediately.

Wood preservation is especially important in the States of the Rocky Mountain region, because of the rapid decay of the most of the native timbers of this region when used in contact with the ground, and the necessity, which grows more pressing with every year, of using these native woods for telephone poles, railway ties, mine timbers and many other uses which expose the wood to decay.

The Federal Government, realizing the great importance of the subject as a protection against the possible rapid decrease of timber in the United States, actively engaged in educating the western timber users to the advisability of treating the different structural timbers, about 1906. In 1908 the Government through the Office of Wood Preservation erected a simple demonstrating plant at Norrie, Colorado, for treating the timber on the National Forests. The Government's work there was to some extent experimental, inasmuch as it operated upon the fire-killed native lodgepole pine, standing in burned over forest tracts. As the outcome of these experiments it has been conclusively proven and actually demonstrated that even this fire-killed timber becomes efficient and extremely durable when treated according to the specifications of the Nation's scientific experts. But it was not permissible for the Government to do more than prove the value of the process, and as the Government does not carry on commercial enterprises, they sought private parties to carry on the enterprise, and the plant was sold to the Denver firm, of which I am a member, and now with certain additions to the equipment and enlargement in capacity it is prepared to turn out approximately 53,000 poles and six million feet b. m. of structural timbers per annum.

The Process.

The process used at our Norrie plant is what is known as the "open tank" process. The apparatus consists of three storage tanks, supported upon a platform high enough to allow the creosote to run by gravity into two treating tanks, one circular ten feet in diameter and nine feet high, and a rectangular tank twelve feet long, four feet wide, and eight feet deep. By the use of a derrick the treating tanks are loaded, oil is allowed to enter to a height in the tank sufficient to creosote the pole to the height stated in the specifications, which is about six feet of the butt on a 25-ft. pole, treating all the buried end of the pole and about one foot above ground. The creosote around the pole is now heated to a temperature sufficient to open the pores in the wood, expel most of the air by expansion, thus forming a partial vacuum. This condition is now relieved by turning off the steam, and thereby stopping the hot bath. The hot oil is replaced by cool oil, which penetrates the pole while cooling is taking place. The duration of this cool bath is made sufficient to give the desired penetration for about a twenty-year service.

The theory of the above process may be given in few words: The heat of the preservative expands and expels a portion of the air and water contained in the cellular and inter-cellular spaces of the wood tissue, and when the cool creosote replaces the hot there is a contraction and condensation of the air and water which remains. To destroy the partial vacuum thus formed the liquid is forced by atmospheric pressure into the cellular and inter-cellular spaces, a process aided, of course, by capillary attraction.

The ease and effectiveness with which timber can be treated by this process depend upon the kind of wood, and whether seasoned or unseasoned. Air is easier expelled than water, and in our native lodgepole pine timber there is very little moisture; it being fire-killed timber, therefore absorbs the preservatives more readily than green timber.

There is probably no reason for discussing the value of the creosoting process in this report, for it is believed that there is no longer any question at this time as to its positive value, provided it is well done.

Life of Creosoted Poles.

It is not merely the expense of the new pole which has to be taken into consideration, but also all the extra expense connected with it, such as the employment of skilled men to erect them.

The prices of the best grades of wood, such as cedar and oak, are becoming so high that the cost of an untreated pole laid down in Colorado is as much as a creosoted native lodgepole pine pole.

At many points in Colorado a creosoted native pole can be laid down for a less price than the imported pole, and the life of this treated pole is estimated at from five to ten years longer than any untreated pole which can be laid down in Colorado. The following is a table of data compiled by the United States Government showing the comparative life of untreated and treated poles:

Species	Average Number of Years Untreated Life	Average Number of Years Treated Life Est. by F. S.
Cedar	12 to 15	25
Chestnut	8 to 10	20
Lodgepole Pine	5	20
Western Yellow Pine	6	25
Cypress	12	25
Juniper	10 to 13	25
Redwood	12 to 15	30
White Oak	8	20
Douglas Fir	8	20

Some of the above data is estimated from test lines put in by the United States Government in cooperation with the American Telephone and Telegraph Company in November, 1906. I do not mean to say that these figures are conclusive, but they go toward showing the benefit of the creosote treatment.

At the meeting of the Dublin Section of the British Institute of Electrical Engineers, held in December, 1902, Mr. A. T. Kinsey gave some interesting figures regarding the life of creosoted telegraph poles, of which the following is an extract:

The author has traced the erection of creosoted poles in Ireland as early as 1858, and again in 1861, but a systematic branding of the date of creosoting was not begun until 1873. It is impossible to identify with certainty the poles creosoted before that time. The result of an examination by percussion showed that the poles thus branded are apparently quite as sound as when first erected. Poles dated 1877 were being taken down,

but were apparently as good as new, and would pay for re-erection.

The best available figures on the life of creosoted poles are from the German Postal and Telegraph Department, which after fifty-two years of observation gives a life of twenty-one years for creosoted Baltic pine. The use of creosote for preserving timber has been shown by the experience of the English and French lines to be beyond question a method which protects those parts injected with it absolutely. Creosote prevents that effect shown by intermittent wet and dry, and makes the timber waterproof.

Advantages.

One of the greatest advantages of creosote treatment for timber is that not only does it lengthen the life of timbers, but it makes the life of all kinds of timber practically the same, so far as decay is concerned. It will readily be seen that if our native pole which without the preservative treatment will last but from three to five years, can be made by treatment to last twenty or twenty-five years, it is much more profitable to use the native pole, which can almost always be obtained at a much cheaper price, than to use an imported pole lasting about fifteen years untreated and for that reason commanding a higher price. The use which preservative treatment makes possible of timber which without that treatment would not be usable at all, is at once a great economy to the individual and a considerable aid toward the conservation of the timber supply. The financial saving is one of the advantages, but being such an important question I have placed it under a separate heading.

The financial saving that would result each year in the United States were a uniform policy of treating timber adopted, is about $72,000,000. It should be remembered that this includes the cost of labor as well as that of the timber itself, and thus represents the amount of money that could be turned each year into other channels, if wood preservation were uniformly adopted throughout the United States.

In the following table, I have endeavored to show the estimated annual financial saving by a proper preservative treatment of poles.

				Years of Life		Annual Charge				
Material	Placed	Total	Cost Foot	Untreated	Treated	Treated	Untreated	Annual Saving	Quantity in Use	Total Amount Saving
$4.00	$3.00	$7.00	$1.50	13	23¼	$0.78	$0.69	$0.9	32,000,000	$2,880,000

This table was figured from averages by the following formula:

$$a = p\frac{1.0\,r^n \times 0.0r}{1.0r^n - 1}$$

a = annual charge, p = investment, n = years in recurring period, r = int. on investment at 6 per cent.

In many cases the consumers require in their specifications poles of larger diameter than the actual service requires, in order that a certain amount of deterioration by decay shall be allowable before replacement is necessary. For example, it is computed that a circumference of not less than 28 inches of sound wood in the pole at the ground line is required to support the strain to which the line is liable to be subjected, and the poles used have a circumference of 36 inches at the ground line, then 8 inches deterioration or the equivalent of a depth of decay of approximately one and a quarter inches is allowable before replacement is required.

In some species otherwise durable the sapwood decays very quickly. Untreated white cedar poles in Georgia, inspected after being set in line four years, showed 45 to 50 per cent of the number with sapwood completely decayed at the ground line, which amounted to an average deterioration of four inches in the circumference, equivalent to an average depth of decay of fully 5-8 of an inch. Cypress poles in Florida, inspected after being in the ground seven years, showed an average depth of decay of 0.8 inch at the ground line. The heartwood of these poles is sound and in nearly all cases is of sufficient dimensions to meet the requirements of the line in which they are used, although graded by the butt circumference they fall decidedly lower than their original class. If poles originally of the same grade represented by these poles after the sapwood has decayed had been used, and the butts well treated with creosote so that their full size and strength would be maintained, not only would the poles be equally as strong as the ones now in use, but their ultimate length of life would be greater. The difference in cost between the two grades of poles in some cases would largely offset the cost of the treatment. It appears that pole users are paying money to secure large diameter sizes of poles in order to secure longer life, that might more profitably be spent for preservative treatment. The possibility of using lighter poles and giving them preservative treatment so as to maintain their full size and strength is one that merits the attention of all pole users.

Wood preservation, then, accomplishes three great economic objects:

(1) It prolongs the life of the durable species in use;

(2) It prolongs the life of the inferior and cheaper wood;

(3) It enables the utilization of these inferior woods which, without the preservative treatment, would have little or no value.

I believe, and most any one who has considered this important subject will agree with me, that the time is at hand when all companies will find that they are obliged to have all their poles creosoted, as at the present high prices of both labor and poles it is too expensive to have to be constantly renewing them.

PRESERVE WOODEN POLES.

It is estimated that there are required for renewals between 500,000 and 600,000 poles per year, and that during the next ten years this number will be increased to 900,000 to 1,000,000. As a result of direct inquiry from a large number of transmission companies, the life of various timbers when used for transmission poles has been calculated as follows: Cedar, 13½ years; chestnut, 12 years; cypress, 9 years; pine 6½ years; and juniper, 8½ years. A committee of the National Electric Lamp Association recommends strongly that the different companies should keep accurate and complete records of poles and cross-arms and collect authentic statistics and literature pertaining to wood preservation.

SOME OBSERVATIONS ON CULTIVATING FRIENDLY RELATIONS WITH THE PUBLIC.[1]

BY J. M. CONNELLY.

Every industry that depends to a great extent upon public favor is taking some cognizance of the bad feeling evidenced in some quarters against the operations of large capital, and several of our large industrial associations are devoting much time and serious study to determine the exact causes of this unrest and to find a remedy for it. The subject is especially uppermost in the minds of those having the management of public service corporations, and in recent years as a result of the attention given it by the National Electric Light Association and its section members, more progress has been made in cultivating a friendly feeling between the companies and their customers than during the whole of the previous life of the association. It would seem that concentrated effort by the large and small units of the electric industry can accomplish as much towards removing undesirable influence in this connection, as has been done in solving the many operating difficulties that have continually confronted companies since the birth of the electric light, power and railway business. Co-operation in coping with this problem is as important, if not more so, than in working out other bad tangles, and this particular worry and bother are sure to give way before the brains that have solved greater perplexities.

We cannot blame the justice of the people's attitude towards indifference on the part of a utility corporation in the matter of good service, and, on just cursory analysis, it is evident that a company is but throwing away business to persist in such arrogance. Nor can any defense be reasonably urged in support of a management tolerating a scant and shabby courtesy towards the public. When it is so easy, and much more profitable, to say a kind word and wear a smile, it is strange company managers are not rigorously insistent that their employes treat customers with unfailing courtesy. However, even when a manager lays down the policy of giving the public the best possible treatment, it is sometimes difficult in execution. The company must deal with the public through its employes, and we all know how prone human nature is to occasionally become officious when clothed with a little authority. The public does not understand that one of the hardest problems for a well intentioned company is to secure men for the different positions who will at all times preserve an even temper and remain the gentleman, no matter what the provocation. As we have frequently heard, a company's employes are largely responsible for the judgment passed upon it by the people. If they are haughty, overbearing, impudent, blunt or peevish, a bitter enemy is made for the company, and the nimble tongue with a grievance to voice against a corporation is sure to cry from the housetops, and usually finds a sympathetic audience. On the other hand, where the employe is courteous, polite, civil, urbane or conciliatory, as the occasion requires, the company makes a friend who will always be ready to say a good word for it. We know of a certain company employe who comes in contact with a number of kickers. They approach him hot-tempered and abusive. He listens complacently to their sputterings and cheerfully returns smile for scowl, the gentle word for the harsh epithet, the kindly eye for the savage glare. So completely does he keep himself in hand that he is scarcely ruffled by the foulest abuse. His courtly demeanor makes the worst cranks his best friends. He says that in the majority of cases he receives apologies for the abuse thrown at his head. That man is one of the most valuable assets of his company.

The old regime of the corporation bound and blinded by a foolish independence erroneously considered one of the excellent advantages of a monopoly, has passed to a deserved oblivion and the principles that obtain in the transaction of private business under the discipline of competition, are being largely employed by the utility companies in dealing with their customers. We do not know that this has come through an improved morality, but we certainly have discovered that fair dealing and fair treatment pay. This is proof enough that the golden rule has as much efficacy in our business as in every other, and the manager who cleaves to the old practices, is taking no note of the growing high and broad standard of business dealing in the electrical world.

If we would contribute our power and influence in nourishing the growth and prosperity of the community in which we operate, we must appeal to the public to leave us free of unreasonable and unjust restrictions. We must ask them to assist us in maintaining our credit so that we may meet our obligations and satisfy the demand for adequate and efficient service. In the West we are growing at such a tremendous rate that it is difficult for a public service corporation to keep pace with the increasing demand on it. It would seem wise to at times inform the people about the expenditures necessary to anticipate the future, so that they can better understand that it is a man's job to raise capital for a plant in a growing city.

No business has suffered more hardships than ours during the brief term of its existence. We have overcome many of the worst difficulties, but there are yet some, the settlement of which will serve to more firmly establish the industry and win for our securities permanent respect and popularity with investors. In spite of the doctrine about competition being the life of trade, we have seen in our business that it usually accomplishes the wreck of property. The people are finding out for themselves that the way to get a reduction in their rates is not to grant a franchise to a competing company. With competing companies in the field, they have too frequently found themselves the victims instead of the beneficiaries of such a pernicious situation. If we will but gather the large amount of data available proving the immense waste of capital and inferior service resulting from conflict between competing companies and give out that information freely where it will do the most good, we will forever coffin this kind of competition.

When the public mind becomes more receptive to our side of existing differences, we should urge our

[1]Paper read before the Colorado Electric Light, Power and wood Springs, Colo., September 21, 22, 23, 1910.

claims for longer term franchises, and as our argument therefor is sound and convincing to a calm and reasonable mind, we can soon expect a change of public sentiment in our favor. Our credit must necessarily be limited by the short term franchise, and on this account the customers of a company are sure to suffer in the later years of the life of the franchise. As we mentioned before, the cities of the West are growing much faster than in any part of the country, and it takes large amounts of capital to provide for the future. It is impossible to finance enlargements and extensions towards the end of the life of the franchise, and in consequence both the company and the people suffer. The service necessarily remains practically at a standstill until something is done to amply secure investors ready to advance the money for betterments. In a report made by the public policy committee of the National Electric Light Association to a convention of that organization in 1907, it was pointed out that the franchises of the companies should be for such terms and upon such conditions as will best subserve the interests of both. It declared that undue restrictions of franchises were analogous in their results to the imposition of unwarrantable taxes. It also indicated that the short-term franchise removed all incentive for the company to make permanent improvements, especially in the latter part of the life of the company. All of these facts in relation to the matter of the securing of franchises of longer term have been strangely slumbering, and there appears to be some unexplainable reluctance or negligence in submitting their merit to the people.

That a public service company can get a hearing and also liberal encouragement from the people in some parts of the country, was brought out in an interesting and convincing speech recently made before the Electric Club by a former Democratic Mayor of Denver. He said that the people will pat a corporation on the back that helps in the upbuilding of a city, provided there is organized co-operation among the elements in a community that can keep the wheels of progress going. The trouble with Denver, and he might have said about the whole of the State of Colorado, was that there was one side trying to build up and another trying to tear down. He contrasted this condition with the spirit of Los Angeles, where the man who brought in large capital was given a handshake instead of a kick. However, if we will stop to consider the element making the kicks against the public utility company, we can hardly get away from the conclusion that we, ourselves, are largely responsible for a good many of the delusions hugged by the dear public. Isn't it a fact that most of us have sat back in our mahogany and allowed our traducers to howl their denunciations without lifting a voice of protest to put our side of the question before the people. If you go before a judge or jury, you don't allow your case to go to final consideration until you have exhausted every means of presenting fully and persuasively your views of the differences involved. Why shouldn't we bestir ourselves as much when questions of public moment affecting us are brought into prominent notice. The majority of the people will listen to reason. The reformer with malice rather than justice for a motive, will not have a dominating influence in your community if you stoutly contend for your just dues. Say what you will about the hopelessness of arguing to a radical element in a community, if you have right and justice in your cause, you will win if you fight your battles with the feeling that you truly deserve to win. Certainly, people will get the wrong impression of you and keep it if you do nothing to root it out. In this connection we wish to call your attention to a case in point. An association of employes of a Denver public service company held a banquet one evening not long ago and the speaking was devoted to the best methods of stopping kicks and winning the good will of customers. The guest of the evening was a brilliant editorial writer of strenuous municipal ownership tendencies. He went to the banquet somewhat reluctantly and for a time acted like a man dwelling in the camp of the enemy. When speech after speech was made dealing with the problems of good service and caring for complaints, he evinced the greatest surprise and was astonished that a great public service company gave such earnest consideration to the question of pleasing their customers. In a speech which he made towards the end of the evening, he confessed that for some time he looked upon public service corporations as buccaneers, and said he felt obliged to rub his eyes and wake from his trance when he heard the speakers discussing ways and means of giving the public good service and good treatment. Nor did he stop with his speech in giving expression to his astonishment. In a lengthy editorial a few days afterwards, he related his experience at this banquet and said that a new era had dawned in the practices of the big corporations which would insure the people the service and treatment to which they were rightfully entitled. If we could give the newspapers frequent cause for such expressions, some of the undeserved odium which attaches to us would soon disappear.

The practice of advertising with a newspaper in the hope of gaining its favor, irrespective of the value of the advertising, is spending money foolishly. A newspaper that could be so influenced deserves the respect of no one, and whatever it says for or against you will have little weight in the community in which it circulates. If a newspaper owner is unprincipled, his every act will be tainted with his defective character, and if he isn't on the level, you will gain more by keeping away from him. You might be friendly with him and stay the blow of his journalistic cudgel for a time, but when he found it more profitable to swing on you, he would not hesitate to do you harm. Honest journalism must be distinguished from the pirate, prowling kind, seeking revenue only, and it is to the sincere and undefiled public prints we should plead our cause. We have no quarrel with the newspaper that stands for fair and square dealing, for such a newspaper is always ready to throw open its columns to your side of any serious question.

There is a disposition with some of us to ignore all kinds of publicity. The man who feels this way is miles behind the procession in the electric industry. All the people read the newspapers and most of those people indirectly shape legislation affecting us. It is important that we cultivate friendly relations with our

influential newspapers, so that we can correct their mistaken notions and supply them with accurate information about our business. Don't flare up if, in the language of the prize ring, an editor takes a wallop at you. Accept your punishment good naturedly, but point out to that editor how shamefully he has fouled you. Shower him with facts to show him he is wrong. You will find that most newspaper men are not such a bad lot and there is much of the milk of human kindness in them. The trouble is that we are too much inclined to rub them the wrong way, and you yourself know that no matter how just you want to be even to your enemy, it is human nature to occasionally jab him when the opportunity presents itself. We have in mind a certain company manager who had some bitter things said about him before he learned the value of being civil to reporters. He purposely allowed them to cool their heels for hours outside his office whenever there was big news to be given out and his interviews were mainly monosyllables uttered with a grunt. No reporter ever lost a chance to take a fall out of this individual. There was an unwritten law in every newspaper office in that city, that whenever the occasion presented itself Mr. Blank was to be dealt with without gloves. So from time to time this gruff gentleman received a grilling that finally reached under his hide. He asked a friend of his one day what he had done to make the newspapers so vindictive towards him, and this good friend out of the charity of his heart told him that just a little courtesy towards the reporters would soon effect a miraculous change. He grudgingly assented to the suggestion and began to treat reporters like human beings. Little by little, this bit of sociability had its effect and as reporters are now always welcome to his office, the personal bitterness has disappeared from the columns of all the newspapers.

Let us consider another case where a man's personality and goodness of heart operate to stave off unfavorable criticism. This man is the head of one of the largest public service corporations in Colorado. His second nature is to hand every one he meets a cigar or stronger refreshment if desired, and it is said that every newspaper man in Denver would, figuratively speaking, sooner cut off his right arm than say an unkind word against him in their newspapers, and this includes those newspapers that are strongly anti-corporation. So magnetic is his influence that not one word has appeared in criticism of his interests since his company began operating in Colorado. This is an uncommon case of an official being able to do incalculable good for his company by force of a happy and inspiring personality.

There is another man whose method of dealing with newspapers will be of interest. He has won praise in every position he has held in the electric world, and most of us could speed more quickly to success by patterning after some of his methods. He absorbs facts as a sponge takes up water, and when necessary knows how to present them. His directness has been one of the chief elements in his success, and in the handling of business demonstrates the geometric truth that a straight line is the shortest distance between two points. No citizen of Colorado keeps better posted on everything concerning his business and few are more familiar with the public pulse. When facts concerning his interests are misstated in the newspapers, he does not boil over them in his office, but quickly beards the editor in his lair. This is what every newspaper wants. It desires personal contact with the heads of our companies, and when we condescend to get off our high horse and meet the newspaper men on common ground, we are pretty sure to escape a considerable amount of newspaper punishment.

There is a newspaper man in this body who served ten years as a reporter and editor on several large metropolitan dailies. He tells some facts which show how reporters—the men who go out to gather the news that makes the paper—often get the worst impressions of heads of large corporations just because these men deny themselves to newspapers. This former scribe says he frequently tried to interview a certain public utility official of great influence in the west and in eastern financial circles. He was never able to get beyond the railing of the outer office, and this was generally the case with the men on the other papers. The official kept himself screened from the public view during his office hours with as much ceremony and mystery as any oriental potentate, and the wiliness of burglars would have found it impossible to break into the throne room with a "jimmy." Now, such exclusiveness would not be expected to stimulate a very high respect for that man from newspapers. The things said about him by the reporters would not look well in print, yet our member newspaper friend found later after he left the newspaper business that he was entirely mistaken in the man. He had occasion to go to him on certain business and not only was he able to gain immediate entrance to the inner office, but he was also given a hearty and cordial greeting. The former reporter was dumbfounded. To expect to meet a man of satanic characteristics and repellant personality and then experience the amazement of stepping into the presence of a kindly, able man, whose quite evident force of character compelled immediate admiration, is not an experience of frequent occurrence. Now there is no public man in the West who has received as much newspaper abuse as this gentleman, and why he never capitulated to the newspapers in the small matter of granting personal courtesies, has always been an enigma to those in the habit of giving much thought to the question of the relations between the public service companies and those responsible for the shaping of public opinion. Certainly there is no doubt but what he could have done much to reduce the savage criticism against his interests which has resulted largely from his habit of exclusiveness towards newspapers.

We can go to the East and find numerous cases of prominent business figures flinging away their armored reserve and courting the friendship of the newspapers. Until a few years ago, John D. Rockefeller put the proverbial oyster to shame in preserving a sphinx-like silence. The muckrakers mucked and mucked, but their most heroic efforts didn't put a dent in his determination to keep his lips sealed so far as talking for publication was concerned. But Standard Oil abuse developed into a condition of hysteria that had a melting influence on the richest man in the world. His friends knew of the kind and affable side to his char-

acter and they pleaded with him to take the country into his confidence and change the prevalent opinion that he was possessed of a heart of adamant and the instincts of a wolf. And the world was startled one day when John D. threw down the bars and broke the silence of a lifetime. Since that time, tons and tons of papers have been used in telling of the better side of the man, and there is hardly a week goes by but what we read some wise counsel given by this old man who is devoting the closing years of his life to many and worthy philanthropies. Rockefeller will undoubtedly go to his grave with the maledictions of many, but it is certain that had he persisted in keeping a padlock on his lips and a barrier of exclusiveness against an insatiable public curiosity, this generation and posterity would know him only as a cruel and tyrannical plutocrat who had employed colossal financial ability to crush his competitors and enslave the masses.

And so it was with Harriman, and is today with many of our great captains of industry. They see they must use publicity to destroy mistaken impressions of them and place their side before the people. In fact, it is well known that no great man is today without a press agent whose office consists of placing such publicity as will be of benefit to his employer, and of using the influence of his friendship with newspaper men to persuade them to discontinue any line of criticism that can be shown to be unjust. However, any man can be his own press agent if he will only employ a little horse sense and try to learn the ropes of our various kinds of journalism.

We wish it understood that no attempt has been made in this report to construct a compendium of principles on this subject, the practice of which would bring you a state of blissful security and peace, much as we would like to discharge such valuable ministrations. In our feeble way, we have sought to spread before you some of the knowledge sprung from within our own industry and in other fields, and if our efforts will be productive of good among the members, then we will surely feel amply rewarded for our labors in the study, investigation and observation of facts and conditions herein described. We only hope that next year will bring about reports of greater progress in cultivating friendly relations with the public and that the time is not far distant when we will all be able to relish the same relief and immunity from unjust public criticism now enjoyed by any honest and well conducted private business.

GAS PLANT ECONOMIES.[1]

BY SHERWOOD GROVER.

To do absolute justice to this subject would require a review of practically all the proceedings of the various gas associations, engineering and chemical societies to date, for the gas business involves the A B C and fundamental laws of both mechanical engineering and chemistry. Although it is not my intention to discuss this question in such detail, it is practically impossible to prepare even a brief article on so broad a subject without being guilty of repeating matter which has already been published. The writer therefore makes due apology to any and all who recognize herein some child of their own brain parading in a different suit of clothes or mayhap even nude. No claim is made for originality, and effort will be made merely to treat the subject in a general way, any original thought, if such there be, speaking for itself.

A gas plant is essentially a chemical manufacturing establishment like a powder works or paint factory, but it differs from all other manufacturing establishments in the manner of distributing the finished product. A gas plant relies on the engineer to handle the product until it is delivered to the consumer on the consumer's premises, while other manufacturing plants turn their finished product over to a teamster or a railroad.

From this fact it also follows that a gas plant is a method of investing capital by which dividends are earned on bonds and stock, and therefore after a plant is completed in every detail, ready to deliver gas to the consumer, we may regard it as a kind of grinding mill, into the hopper of which we pour the money to buy the raw products and the labor necessary for the fabrication of the finished article, and from the bottom of which we take the money which we got from the consumers as the price of our finished product. The factor which determines the relation between what we put in at the top and take out at the bottom is the economy of the plant.

The economy of a plant can best be divided into two branches: the economy of installation or construction and the economy of operation.

Economy of Installation.

As the construction is naturally the beginning of a gas plant, let us first consider in a general way a few of its essentials. After a territory has been surveyed, with a view to installing a gas plant, and the advisability of such installation has been definitely determined, the first economy is the most advantageous location of the gas works. The earliest elementary books on the gas business will tell you to locate the works at the lowest point in the territory to be supplied, at the same time having due regard to the most advantageous transportation facilities for your raw material. Although the development of high pressure distribution has to a certain extent nullified the advantage obtained in distributing from the lower level to the higher, we know that high pressure is limited in its field and therefore this fundamental economy remains unchanged.

In the construction, the first and foremost economy which can be applied is that of absolute safety, particularly in foundations.

Assuming that the design is as near perfect as possible, the next is in the selection of machinery, and it is needless to say that only the best should be chosen. All of the latest labor saving devices as well as those for improving efficiencies of moving machinery should be installed. When the engineer lays out the steam generating and distributing system, he should bear in mind the best practice in power plant design, that dry steam is as desirable in a gas works and that a steam separator belongs on a gas generator as well as on a high speed engine. These facts are obvious and when an engineer has the opportunity to build

[1]Paper read at eighteenth annual convention Pacific Coast Gas Association, September, 1910.

a complete new plant to suit a given condition, there is no excuse for not building on lines of greatest economy. Unfortunately this is not the condition which engineers and superintendents are generally facing in the West. We are developing a new process, and at the same time endeavoring to keep pace with a growth and consequent demand for our product, which I believe is unparalleled in the history of the gas business. There may be isolated cases of rapid development, but with our case it is general throughout the territory and due to natural growth, and not to any special campaign of advertising or education on the part of the gas company. The ensuing tables are quoted as two examples of this growth in places which widely differ in size. They are the extremes in size of the plants coming under the writer's observation and others could be quoted ranging between the two.

TOTAL SALES PER ANNUM.

Year	Plant No. 1	Plant No. 2
1900	227,035,600	
1901	267,662,600	
1902	306,827,600	2,829,700
1903	406,999,600	5,054,000
1904	490,914,700	7,872,300
1905	563,005,600	10,411,100
1906	880,622,800	11,498,600
1907	1,260,852,700	15,074,500
1908	1,394,254,200	17,420,200
1909	1,438,115,280	19,586,300
1910, including August....		15,295,800

Almost all of our plants have passed through the stages of being coal-gas plants, combination coal and water-gas plants, water and oil-gas plants, and now finally becoming lampblack gas, which is water-gas made from the lampblack by-product of the oil-gas process. This lampblack gas has now reached the stage where a lampblack gas machine can be designed for a given oil-gas plant to use all the surplus lampblack, thus making a perfect balance. This was explained in Mr. E. C. Jones' paper before the American Gas Institute last October.

With plants which are the result of such development it is obvious that there may be many existent faults of design which by a little study and care can be remedied. The relative positions of the generators, boilers, lampblack separators and moving machinery should be carefully considered with the following points in view. Where lampblack is used for boiler fuel, the separators must be located with a view of economy in handling; in a small plant where hand labor is used entirely for lampblack it is almost impossible to locate the separators too close to the boilers, while in a larger plant, where mechanical handling is the rule, the matter of storage must be considered and location made so as to not only supply boilers economically but also lampblack gas generators as well. Between the generators and separators the main thing to consider is a short direct lampblack drain of ample size avoiding sharp turns which tend to bank up the lampblack.

That the moving machinery and generators, where the greatest amount of steam is consumed, should be so located with respect to the boilers as to insure the shortest possible steam line, is obvious. There are, however, a number of minor uses of steam which if not carefully watched are sources of small loss individually, but in the aggregate are considerable, i.e., steam used in scrubbers, foul mains, relief holder drips, etc. All leads for such purposes should start from the main steam line with a controlling valve so that they contain live steam only when in use, and these controlling valves should be so placed or equipped with extension handles that a man does not have to climb a ladder to operate them. It would seem unnecessary to emphasize the necessity of properly covering all steam drums, piping, etc., with non-conducting material, but it is a matter which is too often slighted, especially in the little side extensions of steam piping which are made from time to time. This may be a relic of the time when the disposal of lampblack was a problem and there was a tendency to overlook minor steam wastes on this account, but now with the production of lampblack practically under control these minor losses must be guarded against. Such losses consist in the transfer of heat from the steam to the air and such transfer is directly proportional to the difference in temperature between them, hence other things being equal the higher the temperature of the steam the greater the loss.

The insulation of pipe lines should not be confined to those carrying live steam alone, but also should be carried out on exhaust pipe, feed water heaters and piping, oil heaters and oil pipe from heater to generator. It might be well to note in connection with oil heaters that where exhaust steam is used their design should be such as to avoid back pressure, otherwise it may be that the advantage obtained by using exhaust steam is more than balanced by the effect of the back pressure on the moving machinery. A well insulated live steam oil heater has many points to commend it, not the least of which is the fact that it will maintain constant temperature of the oil under any prolonged or varying pull. This is one of the features in our gas works which varies from plants wherein water-gas is made. We must heat nearly three times as much oil per thousand feet of gas made, and that of a kind more difficult to handle.

The matter of scrubber and relief holder connections is one of special importance in the matter of oil-gas making. The process, as developed today, differs from water-gas in the speed of generation per unit of actual generating time and has a decided peak moment of generation during this time of actual generation. Therefore, to take advantage of this peak and prolong its duration is to our advantage. By so doing the output and efficiency of the generator is increased.

The most important factor to consider in obtaining this result is the resistance of the foul main, the scrubber and relief holder connections. These should be of generous proportions, avoiding sharp turns as much as possible, but where necessary they should be provided with crosses or hand-hole elbows equipped with quick opening doors, giving an opening the full size of the main, and also affording a gas-tight fit when closed. This permits thorough cleaning in the shortest possible time.

Another little feature which is peculiar to oil-gas is the fact that the crude gas holds in suspension a certain quantity of microscopic lampblack which any amount of ordinary scrubbing fails to throw down. It does deposit in the oxide, however, and reduces its life as well as retarding its efficiency. The installation of an "ammonia washer" on the outlet of the relief

holder has been found to overcome this fault. These washers force the gas to pass through water in a finely divided state and precipitate the lampblack.

Leaving the manufacturing end of the business and taking up distribution we find that a great many plants are a combination of low and high pressure, the high being an auxiliary of the low pressure system. In such installations there is one tendency to be guarded against, i.e., the low pressure system is inclined to throw most of the load on the high pressure, and if not watched will eventually result in an installation which is top heavy, with the high pressure doing most of the work. This condition is partly a result of growth and extensions to the high pressure mains without corresponding development of the low pressure, and also due to the fact that the regulators feeding from the high into the low pressure system are set to a given pressure and, unless adjusted daily, maintain their pressure throughout the twenty-four hours and will assume the night load, if they are set for a pressure equal to that given by the storage holder, which is generally the case. If set for a pressure above that of the storage holder, still more work will be thrown on the high pressure system. The amount of this extra work varies with different conditions, the greater the distance between storage holder and regulators and the smaller the size of low pressure mains, the less the amount of work thrown on the high pressure system.

The writer firmly believes that the field of high pressure distribution has been definitely determined and its application limited, if not now, it will be in the very near future, to suburban districts and such widely scattered territory where a low pressure system would be prohibitive in cost, where growth is not rapid, and a higher price can be charged for gas.

Where high pressure feeders are in use to feed outlying territory contingent to cities and also are used to boost up weak places along the line, the low pressure system should be extended to relieve the high pressure feeders as the intervening territory fills up, and by so doing keep the installation of compressors as small as possible consistent with the development of a given community.

Let us take, for example, a city or town which has outgrown the low pressure system, a town which is alive and will keep on growing and it needs a new main feeder or feeders. Figure out the cost of low pressure mains, then of equivalent high pressure mains, say 20 lb. pressure, feeding in at every intersection, which it must do to be the exact equivalent of the low pressure. This means manhole and regulator at each. Add to this the cost of the compressor plant and you will find there is not a great margin in favor of the high pressure except that the pressure can be raised and capacity thereby increased. Then we must consider the fact that the high pressure requires constant care and attention, not only for the compressors, but the regulators as well. Looking at it from the point of view of the bond or stockholder, I would rather have my money invested in cast-iron pipe, assuming its life to be fifty years, whose maintenance is practically nil, than in an installation of reciprocating machinery such as compressors in conjunction with wrought iron or steel pipe. The life of the pipe depends upon the reliability of the man who does the coating. The life of a compressor at highest efficiency is not over fifteen years, and as they must be overhauled at least once a year and have a high maintenance cost. Carelessness on the part of the operator may badly damage or completely wreck a machine.

In these arguments favoring the ultimate economy of the low pressure system the writer is not ignorant of the fact that high pressure has bridged over many financial difficulties for gas companies, but it is a toll bridge and not built of sufficiently durable material to withstand heavy traffic.

There is in this connection a matter to be considered which will be an important element favoring low pressure in the future development of the gas business. The present tendency of political development in our states and cities is toward regulation of public service corporations. Those who have watched the working of the public service commission of New York have no doubt observed the trend of events. There is little doubt that a similar commission will eventually exist in all the states. By the regulation of such a commission a corporation is allowed to earn interest on or issue securities covering actual investment only. Such rules will work against the system with cheaper first cost but higher operating expense.

Economy of Operation.

This whole subject might be summed up in the following expression: "Know what your plant is doing at all times, and as well know the condition of your plant while doing it."

This is a rather inclusive statement and means first that a works should have a full equipment of apparatus for recording and making observations beginning with the photometer and gas analysis set and including all of ordinary indicating instruments, such as thermometers and U gauges between scrubbers, at each side of exhauster, and other important points throughout the works, oil and steam nozzle gauges on generators, recording gauges in superintendent's office connected to each generator, etc. The writer has never seen a gas works with too many such devices installed. These instruments are, however, of no use unless properly cared for and kept in working order, any more than is a station meter which is not tested often enough to be kept accurate.

After considering the equipment as above, then there remain the many odd little leaks, small individually, but having in the total a marked effect on the economy of the plant, such as small leaks in steam lines, valve stems, or long runs of steam line to idle equipment with no main cut-out valve, leaky stuffing box glands on engines, compressors, pumps, etc. Holder carriage rollers should be oiled and an inspection of holder cups made during the dry season to keep them filled and prevent blowing (this is a slight compensation to our Eastern brethren who have to prevent freezing in the winter). Some plants shut down their boilers too often on account of poor water when a proper chemical treatment to suit the given condition or even filtration where sand or grit is present would effect an appreciable saving.

The fact is the possible economies in a gas works are as many and as varied as the parts that go into its making, and are limited only by the care and resourcefulness of the man in charge, which brings us to what is really the biggest and most important factor in the economy of a gas plant—the personal one.

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POWER AND GAS

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Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
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Popularizing Electricity

A soft answer may turn away wrath but it takes hard facts to destroy it. How can an electric company expect to establish friendly relations with its patrons by tact and courtesy when the public knows so little about what they are buying? Confidence and ignorance are never chums. The first essential is to educate the layman, to introduce scientific terms into the vernacular so that the buyer and seller may speak in the same language.

That the layman is eager to learn is attested by the increased demand for books and articles on popular science. Yet the jokes in books are not half as funny as when told on the stage; so likewise it is necessary to talk directly to the people to make them understand how electricity is produced and what it will do. Just as the clown is the smartest man in a circus, so it requires the most brilliant minds to explain scientific matters simply. In these respects, at least, science and humor are akin.

During the past summer a number of electrical manufacturers employed a college professor to roam around their works, just as does a "business doctor" who is sometimes called in to diagnose and prescribe for business failure. But this professor's mission was somewhat different. He simply talked with the men, encouraged them to ask questions and explained in simple language the scientific principles underlying the work they were doing. The companies considered the investment so good that they plan to repeat it at frequent intervals in the future. This professor possessed the rare faculty of popularizing science, of making technical matters clear to the common people. He taught the rudiments of a new language.

True it is that they learn only a sort of pidgin English, a makeshift that has little scientific use insomuch as what is gained by generalities is lost in definiteness. An English translation seldom does justice to a German original, for certain beauties of language are lost in the interpretation just as power is lost in transforming a high voltage current to one of lower potential. The petrographer uses a high power microscope to examine rocks but a cheap magnifying glass suffices for the prospector, giving a larger field but smaller resolving power. We do not use a thirteen inch gun to shoot rabbits, nor is it necessary that the layman be equipped with the ammunition of the scientist to gain a general knowledge of electricity. But if he be supplied with an elementary knowledge he can be brought to a sympathetic appreciation of the wonders of electricity and if he so desires may even use it as a skeleton key to unlock the more intricate subjects.

All employees of electrical companies should be well informed regarding the elementary principles of electricity and be ready at all times to explain them to consumers. A small pamphlet explaining the meaning of a watt, a volt and an ampere and showing how they are measured, as well as giving directions for reading meters would be a good investment if given general distribution. Illustrated lectures and simple experiments at schools, church, clubs and other organizations, sow the seed of confidence broadcast, and not only dispel the prejudice due to ignorance but also establishes the desired amicable relations with the public.

PERSONALS.

R. S. Masson was at Los Angeles during the past week.

Frank G. Drum, president of the Pacific Gas & Electric Company, recently returned from New York City.

W. G. Vincent, Jr., who spent the past six weeks at Los Angeles on electrical engineering work, has returned to San Francisco.

E. C. Bradley, vice-president and general manager of the Pacific Telephone & Telegraph Company, returned last week from an Eastern trip.

Clarence Follis, formerly connected with the Brooks-Follis Company who is now a resident of New York City, has been renewing old friends at San Francisco and vicinity during the past week or two.

G. W. Rounds, formerly general superintendent of the Savannah Electric Company, of Savannah, Ga., has been appointed general superintendent of the Tacoma Railway & Power Company, of Tacoma, Wash.

B. C. Carroll, general agent and George B. Bush, general commercial superintendent of the Pacific Telephone & Telegraph Company, are making an inspection tour of the Pacific Northwest via Seattle and Spokane, Wash.

H. H. Noble, president of the Northern California Power Company, consolidated, has returned to San Francisco after a trip to the new plant at Coleman, which will add about 20,000 h.p. to the capacity of the system within a few months.

John F. Dostal, superintendent of the electric department of the Denver Gas & Electric Company was elected Jupiter at the Birmingham, Ala., convention of the Rejuvenated Sons of Jove. Denver, Colorado, will be the meeting place for the 1911 convention.

John W. Gilkyson has been appointed division commercial superintendent of the Pacific Telephone & Telegraph Company with headquarters at Los Angeles, vice C. M. Seeley. The appointment becomes effective November 1. Mr. Gilkyson was formerly division superintendent of plant at Los Angeles.

Le Roy P. Sawyer, president of the Buckeye Electric Co., and vice-president of the National Electric Lamp Association, is visiting the Pacific Coast, ostensibly on pleasure, but in

Le Roy P. Sawyer

reality transacting much business. From Denver he went to Los Angeles and after visiting Catalina, Pasadena and Del Monte, he reached San Francisco last week. Here he spent most of his time with Andrew Carrigan, of Dunham, Carrigan & Hayden, who are Pacific Coast distributers of the Buckeye lamps. Mr. and Mrs. Sawyer were royally entertained during their visit and left for Portland and Seattle this week with a favorable impression of California hospitality, Mr. J. A. Vandergrift, manager of the Oakland Warehouse, the distributing center for National Electric Lamp Association lamps participating largely in producing this impression. Mr. Sawyer is particularly enthusiastic regarding the engineering department of the Association which has already attracted many engineers and is making special inducements to recent college graduates, particularly Western men.

NEW CATALOGUES.

Bulletin No. 125 from Crocker-Wheeler Co. illustrates and describes the construction of Remek type transformer for light and power.

The General Electric Company recently issued Bulletin No. 4773, entitled "Thomson High Torque Induction Test Meter, Type IB-4."

Bulletin No. 123 from Crocker-Wheeler Co. illustrates and describes the application of Form D direct current motors and generators, 25 to 300 horsepower.

The General Electric Company has superseded its old bulletin on "Centrifugal Air Compressors for Industrial Air Blast and Exhauster Service," by Bulletin No. 4774.

The Waverly Electrics for 1911 are attractively described in a handsome brochure from the Waverly Company, Indianapolis, Indiana. Typographically and mechanically it is a beautiful exemplification of the printing art and brings out to excellent advantage the good points of this machine.

Bulletin No. 120 from the Crocker-Wheeler Company, is devoted to their Form I belt type direct current motors, 3¾ to 50 horsepower. These are particularly applicable to machine tools, pumps, printing presses, laundry machinery, hoists, etc. Form IF and Form L motors designed for closer speed adjustment, are described in Bulletin No. 123.

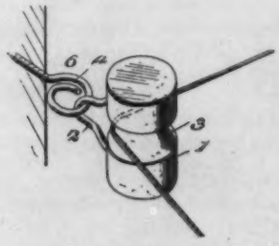
The Insulator Book from the Locke Insulator Mfg. Co., represented on the Pacific Coast by Pierson, Roeding & Co., is one of the most valuable catalogues ever issued upon this subject, containing much data on pole and tower line construction, arranged in a loose leaf binder. The sections on insulator testing are illustrated from photographs and drawings showing apparatus used, including a 300,000 electrostatic voltmeter.

Modern Street Lighting by Luminous Arc Lamps is the title of an attractive booklet just issued by the General Electric Company which is devoted to the suject of street lighting by the General Electric series luminous arc rectifier system. The vertical carbon flame arc lamp is illustrated and briefly described. The station equipment required for this system is mentioned, and a list of cities in which the system has been installed is given. The number of the publication is B-3014.

Bulletin No. 1020, describing magneto non-multiple switchboards of the No. 1800 sectional unit type, has just been published by the Western Electric Company. The bulletin, which is illustrated with many photographs, contains a detailed description of the line circuit apparatus, paying attention both to combined jacks and signals and the line drops. A list of the apparatus required. with different varieties of cord circuits, is given, and other sections are devoted to a description of the operator's telephone circuit and its apparatus, the ringing and night alarm circuit and apparatus, wiring and cabling and line terminal arrangement. The switchboard units are described, as well as methods of assembling these units.

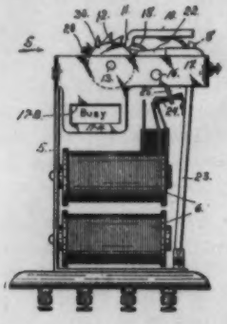
PATENTS

973,409. Insulated Hanger. Edward Crabbe, Seattle, Wash. A hanger or support for electric wires comprising a block having a circumferential groove, a yoke projecting from



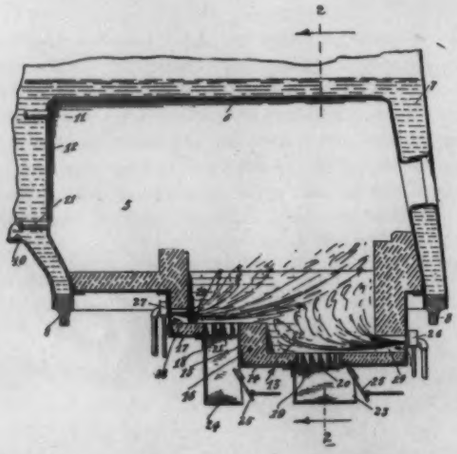
said block and spanning said groove, and a support having an involute spiral with which said yoke is designed to engage.

972,988. Indicating Means for Party-Line Telephones. James H. Blythe, Denver, Colo. An indicating means for party line telephones consisting of an indicating plate, a disk



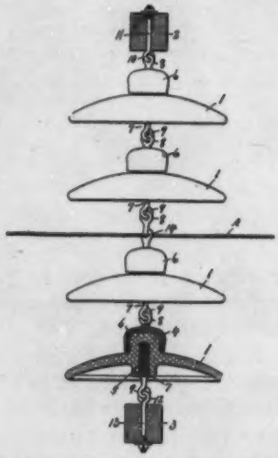
having a cam recess on the face of the inner periphery of the disk, suitable means for actuating said disk, and means for limiting the movement of said disk for the purpose set forth.

973,110. Oil-Burning Steam-Boiler. Charles A. Hammel, Los Angeles, Cal. The combination with a steam boiler having a firebox, of means for delivering hydrocarbon flames from the front and rear of the firebox toward each other into the firebox, means for establishing a draft of air into the



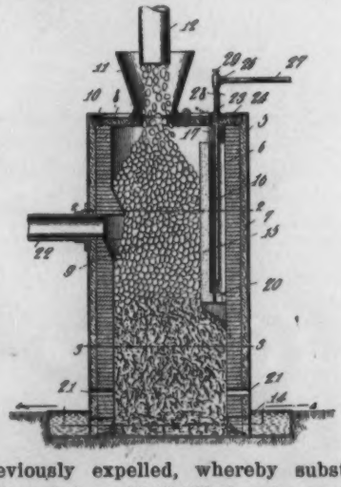
firebox adjacent the flame delivery means, a plurality of means for admitting air directly into the firebox below the flames, one of said means for each burner flame, and means located beneath each of said air admission means for controlling the volume of air to said admission means.

973,204. Insulating System for High-Potential Electric Conductors. Fred M. Locke, Victor, N. Y., assignor to The Locke Insulator Manufacturing Company, Victor, N. Y. A system of insulation for high poteltial electric conductors comprising a series of insulators arranged in superposed sequence some distance apart, supports at opposite



ends of the series, connections between the supports and adjacent insulators whereby the insulators may turn with respect to the supports, separate connections between adjacent ends of the insulators whereby each insulator is free to turn, and a seat for a conductor on one of the last named connections and between the supports.

972,864. Method of Producing Gas. Edmund G. Jewett, Bellingham, Wash. A method of producing gas which consists in blasting a bed of fuel to incandescence, and simultaneously distilling a superposed body of fuel, and carrying the distilled and separated matter successively into contact with an excess of oxygen, to burn the same and then injecting said hot products of combustion by a steam blast, into the incandescent body of fuel from which the distilled matter



has been previously expelled, whereby substantially complete combustion of the said distilled and separated matter is first effected, and the products of said combustion, together with the excess oxygen are injected into said incandescent body of fuel, the combustion of the distilled and separated matter taking place in a chamber inclosed by and communicating at its opposite ends with the chamber containing the incandescent bed of fuel.

INDUSTRIAL

COMBINATION FUSE AND SERVICE BOXES WITH INTERCHANGEABLE FITTINGS.

The Johns-Pratt Company, of Hartford, Conn., through their sole selling agents, the H. W. Johns-Manville Company of New York, has recently placed on the market a large and complete line of Noark fuse and service boxes, of both weatherproof and water-tight types. These various boxes and fittings have been given approval by the Underwriters' Laboratories, and consist of boxes for 250 and 600 volts, all capacities, for two and three-wire systems and accommodate Noark enclosed fuses of the national standard types.

Figs. 1 and 2 show construction of water-tight boxes which may be used for house service work, as well as aerial and subway work in connection with iron pipe conduit, and

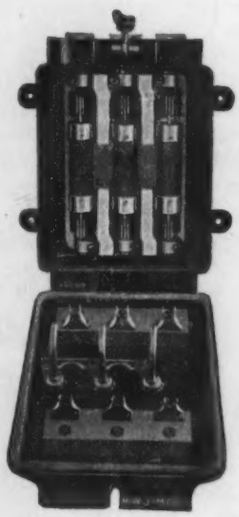


Fig. 1.

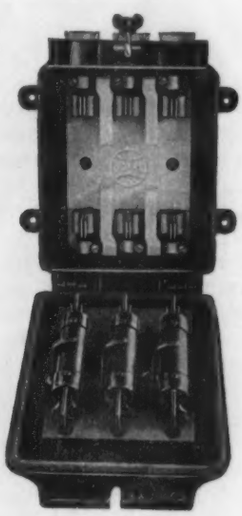


Fig. 2.

where used for subway work, cable sleeves may be inserted into the various types of interchangeable conduit fittings for the purpose of making wiped joints on lead covered cables.

Fig. 1 shows the fuses in circuit, and Fig. 2 illustrates fuses withdrawn from the circuit by means of a handle on the outside of the cover which simultaneously actuates three fuse carrier hooks within the box, thus withdrawing the fuses and performing the function of a switch.

Each end of Noark fuse and service boxes is provided with a large oval box having a machine surface which is drilled and tapped to accommodate various types of fittings and the porcelain bushings extending therefrom are fastened in the box with soft lead washers, forced into place under heavy pressure, which permanently holds them in position.

The larger sizes of these boxes are provided with galvanized chains to prevent the hinges from becoming broken from careless manipulation. All boxes are provided with sealing arrangements.

THE WONDERS OF THE WESTERN ELECTRIC.

According to Herbert N. Casson in the Telephone Review the Western Electric Company is an immense aggregation of workshops in which have been made three-fifths of the telephone apparatus of the world. The mother-factory of this globe-trotting business is the biggest thing in the spacious back-yard of Chicago; and there are eleven child-factories scattered over the earth from New York to Tokio. To put its totals into a sentence, it is an enterprise of 26,000 man-power, and 70,000,000 dollar-power; and the telephonic goods that it produces in half a day are worth $100,000—as much, by the way, as the Western Union refused to pay for the Bell patents in 1877.

The Western Electric was born in Chicago, in the ashes of the big fire of 1871; and it has grown up to its present greatness quietly, without celebrating its birthdays. At first, it had no telephones to make. None had been invented, so it made telegraphic apparatus, burglar alarms, electric pens and other such things. But in 1878, when the Western Union made its short-lived attempt to compete with the Bell Company, the Western Electric agreed to make its telephones. Three years later, when the brief spasm of competition was ended, the Western Electric was taken in hand by the Bell people, and has since then remained the great workshop of the telephone.

The main plant in Chicago is not especially remarkable, from a manufacturing point of view. Here are the inevitable lumber yards and foundries and machine shops. Here is the mad waltz of the spindles that whirl silk and cotton threads around the copper wires, very similar to what may be seen in any braid factory. Here electric lamps are made, 5000 of them in a day, in the same manner as elsewhere, except that here they are so small and dainty as to seem designed for fairy palaces.

The things that are done with wire in the Western Electric factories are too many for any mere outsider to remember. Some wire is wrapped with paper tape at a speed of 9000 miles a day. Some is fashioned into fantastic shapes that look like absurd sea-monsters, but which is reality are only the nerve-systems of switchboards. And some is twisted into cables by means of a dozen whirling "drums"—a dizzying sight, as each pair of "drums" revolves in opposite directions. Because of the fact that a cable's inveterate enemy is moisture, each cable is wound on an immense spool and rolled into an oven until it is as dry as a cinder. Then it is put into a strait-jacket of lead pipe, sealed at both ends and trundled into a waiting freight car.

No other company uses as much wire and hard rubber or as many tons of brass rods as the Western Electric. Of platinum, too, which is more expensive than gold, it uses 1000 pounds a year in the making of telephone transmitters. This, of course, is imported from the Ural Mountains. The silk thread comes from Italy and Japan. The iron for magnets comes from Norway, the paper tape from Manila, the mahogany from South America, and the rubber from Brazil and the valley of the Congo. At least seven countries must cooperate to make a telephone message possible.

Perhaps the most extraordinary feature in the Western Electric factories is the multitude of its inspectors. No other sort of manufacturing, not even a government navy-yard, has so many. Nothing is too small to escape these sleuths of inspection. They test every tiny disc of mica, and throw away nine out of ten. They test every telephone by actual talk; set up every switchboard and try out every cable. A single transmitter, by the time it is completed, has had to pass 300 examinations; and a single coin-box is obliged to count 10,000 nickels before it graduates into the outer world. Seven hundred inspectors are on guard in the two main plants at Chicago and New York.

TRADE NOTE.

The General Electric Company has sold to the Atchison, Topeka & Santa Fe Railway Company two A. T. B. 2, 100-kw., 3600-r.p.m., 400-v., a.c., non-condensing Curtis steam turbines, with direct-connected exciters The new equipment is to be installed at Barstow, Cal., where the Santa Fe has repair shops.

THE ELECTRIC VEHICLE BATTERY[1]

BY BRUCE FORD.

Although primary batteries have been used to a small extent experimentally as the motive power of electric vehicles, the storage battery is the recognized standard for this purpose. Storage batteries may be divided into two classes according to the nature of their electrolytes; first, that having an acid solution; second, that having an alkaline solution.. Neutral salt solutions although employed to a large extent in primary batteries have never been used successfully in storage batteries. Where alkaline solutions have been employed the electrolyte has invariably been a solution of caustic potash. The electrodes used with the alkaline solution have been various metals and oxides, such as copper, silver, nickel or cobalt in the positive pole electrode, and zinc, cadmium or iron in the negative pole electrode. In some batteries of this class metals are permitted to go into solution, although such batteries are not now being commercially exploited, and the alkali batteries of today are constructed with insoluble materials in both electrodes. The Edison and Jungner batteries are the most familiar examples of this type.

In the acid battery, although various solutions have been proposed and tried, dilute sulphuric acid is the recognized commercial standard for an electrolyte. Soluble electrodes, although at one time considerably exploited, have been abandoned in favor of insoluble electrodes, and the recognized standard material in both positive and negative plates is now lead. The lead cell is the oldest commercial form of storage battery, dating back to 1860. Although the principles involved in the lead-sulphuric acid battery are the same as when it was originally brought out, yet the methods and results obtained have been the outcome of exhaustive experiments, some of which are still in progress, while many new experimental lines are being continually developed. The lead-sulphuric acid battery has characteristics of high and uniform individual cell voltage on discharge combined with low internal resistance and high watt-hour efficiency which render this type of cell peculiarly adapted to the needs of electric vehicle propulsion where high currents are required for acceleration, hill climbing and bursts of speed. The nickel-aliki-iron battery has a high capacity per unit of weight which makes it attractive where an abnormal amount of mileage is required per charge. The manufacturers of this battery also claim a very long life. The battery is new in commercial operation, and therefore no definite commercial figures have been obtained as yet to substantiate this claim. High internal resistance and high initial cost are among its disadvantages.

In the present standard type of lead cell the capacity per pound can be varied within certain limits by furnishing plates of different thicknesses. A thicker plate has a longer life in number of cycles of charge and discharge than a thin plate, but its capacity per pound on each discharge is not so great. The makers of the "Exide" battery have developed commercially several thicknesses of which three will be described as being representative. The standard "Exide" battery has a positive 7-32 in. thick and gives a capacity initially of about 8 1-3 watthours per pound of complete cell at its five hour discharge rate, and this capacity will increase to about 10½ watthours in service. The "Hycap Exide" has a positive plate 3-16 in. thick, will give initially about 9¼ watthours per pound and will work up in service to about 12 watthours per pound of complete cell at the five hour rate of discharge. The thin plate battery has a positive 9-64 in. thick, will give initially about 10 watthours per pound, and will work up in service to about 13¼ watthours per pound of complete cell at the five hour rate of discharge. There are of course more plates per pound of thin plate battery than of thick plate battery. Experience has demonstrated that with a given weight of battery where about the same percentage of the full capacity of the battery can be utilized on each discharge, the life in miles of the thin plate batteries is about the same as that of batteries equipped with the thicker plates. In other words, the extra mileage obtainable on each discharge practically compensates for the reduced number of discharges obtainable during the life of the batteries having the thinner plates.

Experiments have shown that the lead battery is capable of considerable further development to produce higher capacity per unit of weight and also to produce plates of considerably longer life. In both the lead and the nickel types of batteries the action which governs the life is largely mechanical. In the respective processes of charging and discharging the battery, the active material of the positive pole plates becomes alternately oxidized and deoxidized. This alternate action causes a molecular disturbance which would eventually cause the active material to lose its coherence unless artificially maintained. In the lead battery it has generally been the practice to permit the active material to become gradually disintegrated and washed out from the surface, and to allow a reserve in the quantity of active material sufficient to produce a commercially satisfactory life. To the carrying around of this reserve active material in the lead battery is largely due to its greater weight per unit of capacity than that of the alkali battery whose active material is maintained mechanically to restrict its molecular disintegration.

For many years experiments have been carried on in this country and abroad to determine what could be done toward preventing the disintegration and washing away of the lead active material. To a Frenchman belongs the credit of having invented the only practical method so far found to actually accomplish this result. The fact was thereby established that by holding the active material in its place the life of the plate can be prolonged with excellent capacity to an almost indefinite period. The mechanical details of construction employed for this purpose were complicated and expensive, and this battery up to the present time has never been exploited to any considerable commercial extent. Recognizing, however, the value of the principle involved, the Electric Storage Battery Company, makers of the "Exide" battery, several years ago secured the American patent rights to this type of cell, and since then have been carrying on a ccurse of experiments with most encouraging results, so that when they put this battery on the market, which will be within a very short time, it will be with every confidence in its future. In its present form this battery will give initially in the neighborhood of 9½ watthours per pound, increasing in use to somewhat over 13, with a life of from two to three times that of the standard lead battery, and during its life the necessity for cleaning the battery of sediment will be eliminated. In the course of the years of experimenting with this battery various means of still further increasing the capacity per unit of weight of the lead cell have been opened up so that a wonderful future may be predicted, not only for the new battery, but for the lead battery as a whole, of which this new battery is only one form.

[1]Paper read at convention National Electric Vehicle Association, New York City, October 14, 1910.

ELECTRIC AUTOMOBILE APPLIANCES.

Bulletin No. 4772, entitled "Electric Automobile Appliances," issued by the General Electric Company, supersedes its previous bulletin on this subject, and illustrates and describes an outfit for charging the storage batteries, as well as a combination ammeter and voltmeter for automobiles. It illustrates Mazda lamps for head-light, side-light and tail-light, and also a lamp for limousine illumination. Automobile motors, controllers and air compressor outfits are illustrated and described.

NEWS NOTES

INCORPORATIONS.

PORTLAND, ORE.—The Oregon Water Power Company has been incorporated by R. B. Candage

OROFINO, IDAHO.—The Orofino Electric Company has been incorporated by K. G. Osterhaut.

REPUBLIC, WASH.—The Kettle Valley Power & Electric Company has been incorporated by Henry B. Russell and Joseph Many for $500,000.

HANFORD, CAL.—The San Joaquin Light & Power Company has been incorporated by W. E. Durfey, E. B. Walthall, A. E. Wishon, A. N. Kemp and L. N. Farnham, with a capital stock of $25,000,000.

SPOKANE, WASH.—The Spokane, Portland & Northern Railway has filed articles for $10,000,000 through E. P. Spalding. The object of the company is to build an electric line from here to Nighthawk, near the international boundary.

AVON, MONT.—The Avon Local Home Telephone Company, capital $10,000, has been incorporated and will at once begin the development of the telephone service in this vicinity. C. G. Mead will have charge of all construction work.

SALEM, ORE.—The Independent Electric Company which has been incorporated in Multnomah county with a capital stock of $100,000 by H. G. Fleischauer, F. Hall and E. Hardy, has completed negotiations for the purchase of the Hillsboro Water, Light & Power Company and the Haines Light & Power Company, which controls a water power plant 16 miles from Forest Grove. The plans of the new company contemplate the expenditure of several hundred thousand dollars for improvements and extensions and consider the extensions of the company's power lines to Beaverton, Orenco, Cornelius, Dilley, Oregon Electric between Beaverton and Forest Grove. R. H. Boykin, who has an office at No. 502 Fenton building, has been made president of the new corporation. The head office of the company will be in Portland.

FINANCIAL.

WHITE SALMON, WASH.—The town of White Salmon will vote on October 29 on the question of issuing bonds in the sum of $7500 to pay off its indebtedness.

WALLACE, IDAHO.—The North Idaho Telephone Company, a local corporation operating in the Coeur d'Alene has been authorized by the board of directors to issue bonds for $50,000 for the purpose of making extensions.

VALLEJO, CAL.—The bond issue of $90,000 recently voted by the people of Vallejo for the purpose of constructing an additional distributing reservoir at Fleming Hill, a few miles from this city, as well as for installing new mains, has been declared valid, the city trustees having submitted the bonds to the firm of Goodfellow, Eels and Orrick of San Francisco. This step was taken as a precaution before calling for bids. Bids for the bonds will be opened on November 16.

LOS ANGELES, CAL.—The Los Angeles Railway Company has increased its capitalization from $5,000,000 to $20,000,000 and changed the last word of its name to "corporation." Howard E. Huntington, general manager, is the principal subscriber, his shares representing all but $6000. His father and others hold the remainder. Great extensions and improvements are to be made with the additional capital. The corporation already operates 240 miles of trackage and this is to be increased by 100 miles within two years.

TRANSMISSION.

FOREST GROVE, ORE.—A. Welch of Portland has been granted a franchise to erect poles and wire for the transmission of power in this city.

FOREST GROVE, ORE.—A. Welch of Portland was granted a franchise by the city to erect and maintain poles and wires along certain streets for the transmission of power and electricity.

LOS ANGELES, CAL.—The Los Angeles Railway Company has petitioned for a franchise through Broadway tunnel so that the Highland Park cars may reach Broadway, reducing the running schedule.

ROSEBURY, IDAHO.—L. A. and N. E. Wayland, who are putting in a power plant at Crawford Falls, have made arrangements with the owners of Tamarack falls site to put in a plant there. A contract has been signed and a stock company is being formed.

OROVILE, CAL.—The Golden State Power Company and the Canton Mining Company, which have been at war over water on the North Fork of the Feather River, have reached a compromise. The Golden State is a sub-company of the Great Western Power Company.

BOZEMAN, MONT.—It is announced that the gas producing plant, which was recently granted a franchise to enter the city, will be erected this fall. Users will be supplied before January 1st. Senator J. C. McCarthy and Chicago capitalists are interested; the cost of installing the plant is approximately $100,000.

REDDING, CAL.—A suit for riparian water rights has been filed by 21 farmers living on Hat creek and Lost creek against the Sacramento Valley Power Company and the Shasta Power Company, which have virtually merged. The farmers contend that their land is being rendered worthless from lack of water for irrigation purposes. It being stated that two dams built by the power companies in the two streams divert 3000 miner's inches of water from each under a four-inch pressure. According to the complaint, there is little water left for domestic purposes after the power companies have diverted what they wish for the generation of electrical current.

REDDING, CAL.—A tunnel 6½ miles long, for conveying water from Pit River to Montgomery creek, is being constructed by the Mt. Shasta Power Company, an organization formed of Eastern capitalists under the direction of Harry Hatfield who has headquarters in San Francisco. A large force of drillers and diggers are at work at both ends of the tunnel, progress of 200 feet having been made at the east end and 150 feet at the west end, it being estimated that the time required to complete the tunnel will be 18 or 20 months. Air drills are being used. The fall of the water from the place of its entrance to the tunnel outlet will be 800 feet.

MANTON, CAL.—J. G. Cochrane, the engineer in charge of the work which is being done by the Northern California Power Company, at Eagle Camp on North Battle creek, three miles below Manton says that the construction work will be completed this week. A dam 65 feet wide and 10 feet high has been constructed. A total of 1325 feet of tunneling has been drilled within a mile. There are six of the tunnels, being respectively 100 feet, 110 feet, 390 feet, 160 feet, 391 feet and 165 feet in length. There is 3674 feet of flumes carrying 2000 inches of water which will empty into Inskip ditch for the purpose of generating power at the Inskip power house, 2½ miles below. This work has been accomplished during the past five months.

TRANSPORTATION.

LOS ANGELES, CAL.—The Pacific Electric Railway Company will extend its new La Habra line beyond Yerba Linda.

MARYSVILLE, CAL.—The City Council has passed the franchise asked for by the Northern Electric Company to lay a line of track across F street.

SEATTLE, WASH.—The Puget Sound Electric Company is constructing new cars for the Seattle-Tacoma run, and expects to have the same in operation by December 1st.

MARYSVILLE, CAL.—The sale of Armory hall to the Northern Electric Railway means the tearing down of that building and the erection on the site of a freight and passenger depot.

OAKLAND, CAL.—The Southern Pacific Railroad Company will next month electrify its Seventh street line here. It is estimated that the company will spend about $200,000 on street paving, exclusive of the cost of straightening the street.

SEATTLE, WASH.—The Seattle-Tacoma Short Line has started construction work on the proposed line. Clearing of right of way has started near Youngstown. James P. Murphy, president, states that the line will be in operation in about two years.

MEDFORD, ORE.—Work will begin in two weeks on the Rogue Valley Interurban, the electric road to be built between Ashland through Medford, to Grants Pass. Resident Engineer W. W. Harmon of the Pacific and Eastern Railroad, will take full charge of the construction of the new electric line.

STOCKTON, CAL.—The Tidewater and Southern Railroad Company, known as the Stockton-Turlock road, announces that it will be operating cars between Stockton and French Camp by December 15. The electric road will use the roadbed of the old Corral Hollow steam line running out of Stockton to a point near French Camp. The company will begin grading November 1.

RENO, NEV.—The city council recently cited the Reno Traction Company to appear and show cause why its franchise for street railway service in Reno should not be revoked. The company failed to obey the citation whereupon the council has ordered the city attorney to institute proceedings to cancel the franchise and have the street car lines sold to pay the expenses of the proceedings. The company will protect itself by litigation.

SAN FRANCISCO, CAL.—Since the recent completion of the second pole line of the Sierra & San Francisco Power Company from the hydroelectric plant on the Stanislaus river to San Francisco, the United Railroads has shut down the engines at both of its steam power plants. The load is being satisfactorily taken care of by the transmission lines. Steam is kept up at the North Beach power station so that power could be furnished promptly in case of emergency.

SACRAMENTO, CAL.—If the plans of the car employes of the Central California Traction Company and members of the Sacramento Carmen's Union, composed of employes of the Sacramento Electric, Gas & Railway Company, are carried out, the traction company men will join the local union. The new company is running "open shop." It is announced that in organizing the traction men will do so with the end in view of consolidating with the local union. This action would make the carmen's union one of the strongest in the city.

ILLUMINATION.

CENTRALIA, WASH.—The city of Centralia is now in the market for the purchase of equipment of a municipal lighting plant.

ORANGE, CAL.—The Orange County Gas Company denies that it has disposed of its holdings in Orange and Anaheim to a Los Angeles corporation.

CHEHALIS, WASH.—It is understood that the Twin City Light and Traction Company has succeeded in floating bonds to the amount of $150,000, the funds to be used in erecting a new power house and other improvements.

REDMOND, ORE.—The Crook County Water, Light & Power Company of Redmond, Ore., has purchased the Cline Falls Power Company's holdings; price is given at $55,000. An additional plant will be installed soon.

SANTA BARBARA, CAL.—The Santa Barbara Gas & Electric Company will start work immediately for a high tension 10,000-volt line from its power station on Castillo street, to a sub-station in Montecito, which will cost $10,000, and will also build a concrete station house.

COLUSA, CAL.—W. M. Henderson, local manager of the Pacific Gas and Electric Company, announces that the company will commence the construction of a steel building to be used as a boiler and engine room. The building will be 50x27 feet and will cost $4000. The electric system is to be overhauled and improved at an expense of $3000, this work is also to be commenced on November 1.

UKIAH, CAL.—Sealed bids will be received by the Board of Trustees up to 8 p. m., December 5th, for the sale of a franchise to erect, maintain and operate a gas generating plant for the manufacture, sale and distribution of fuel gas and gas to be used for fuel and heating purposes, to lay and construct pipe lines in, along, through and under all of the alleys, streets and avenues in the city of Ukiah, which has been applied for by the Ukiah Gas. Company.

BISBEE, ARIZ.—The Los Angeles Trust Company of Los Angeles has filed suit at Tombstone demanding a receiver for the Bisbee Light & Power Company, the only gas manufacturing concern in Bisbee. The International Gas Light Company, the Michigan Trust Company of Detroit, Mich., and W. H. Goode of Los Angeles are mentioned for the appointment of the receivership. The International issued $40,000 in bonds and after becoming the Bisbee Light & Power Company, the concern issued $200,000 in bonds. The Michigan company is the trustee for the bondholders who purchased the Bisbee Light & Power Co.'s bonds. W. H. Goode has a $4000 judgment against the company. The interest on bonds has defaulted. The assets of the company are placed at $75,000 and its bonded indebtedness at $244,000.

TELEPHONE AND TELEGRAPH.

SANTA ROSA, CAL.—With the completion of arrangements for the issuance of $300,000 bonds by the Clear Lake Consolidated Telephone Co., a big merger of telephone lines has been effected. This company, recently organized, has taken over all the properties, rights and franchises of the Clear Lake Telephone and Telegraph Company, operating lines in Lake, Mendocino and Napa counties, the Northwestern Telephone & Telegraph Company, operating exchanges and lines in the Sonoma Valley, along Russian River and other points in this county; the Gold Ridge Improvement Company, operating lines in the Gold Ridge section of this county, and the plant of the Northwestern Electric Company. The systems are connected with the main system at Ukiah, Cloverdale, Santa Rosa, Sonoma, Sebastopol and other points. A. H. Spurr is the president and Fred L. Wright of this city is the secretary and general manager.

WATERWORKS.

TACOMA, WASH.—A contract for the work of laying a new water system for the tide flats was awarded by the commissioners to P. E. McHugh at $49,190.

BELLINGHAM, WASH.—The contract of the city with the Larson Lumber Company for pumping water from Lake Whatcom to supply Silver Beach and other territory adjacent has been signed by the representatives of both the city and the lumber company and is now in effect.